

1<sup>st</sup> April 1901

I certify on Soul and Conscience  
that I have composed this  
Thesis.

The cases observed occurred in my  
Practice during the year 1899.

MR CUM (Edin)  
LRCPSE. LTHSE.



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# INFANTILE DIARRHOEA.

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Practical Treatment of

Children and Infants

By W. B. Saunders, M.D.

and J. H. H. H. H. H.

Phila.

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- (1) Starr, Louis, M.D.  
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  - (2) Carmichael, Jas. M.D., F.R.C.P.E.  
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Diseases of Children.
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-

Amid the many states of sickness with which the general practitioner is brought in contact, no condition is so frequent as that of infantile diarrhoea. It is a very serious condition, and one of the great agencies by which the premature death of a large proportion of the population is accomplished,- a form of infanticide too little studied by the general practitioner, and too little regarded by the public-. It is a subject upon which many opinions have been stated, and a great deal said perhaps which has too little reference to everyday practicability. This may be accounted for by the complexity and difficulty attendant upon the study of such a condition as Infantile Diarrhoea. With the consciousness of this fact before me I have submitted in these pages my modest observations of eighty cases of this condition, which occurred in my ordinary practice last year, omitting such conditions as Typhoid, Tubercle, or other organic lesion in which diarrhoea often is a prominent symptom. My cases occurred in infants up to the second year of life, and I attended to the general bearing of each case as it cropped up, paying attention to treatment;- because this complaint often strikingly repays an attentive and discriminating treatment.- It might be advantageous however before going further to describe shortly the place in which my cases occurred. Lochwinnoch for so it is named is in the County of Renfrew-a well watered County

and holding a position of importance amongst the Counties of Scotland in respect of population -.

The Parish of Lochwinnoch is said to be 12 miles long from East to West and 6 miles broad from North to South. It contains about 19250 English Acres. It is very irregular and hilly along the Western and Eastern border.

Between these ranges of elevated land - North to South - is a valley; and in this valley the village stands.

Lochwinnoch is greatly diversified in its general aspect.

Part of it consists of high and bleak hills in the back ground, part of it is a low winding valley, in general of a very fertile soil, and in the heart of it is the largest Loch in the County. This valley with the shelving Country towards it on both sides contains nearly the whole population. The high district on the West lies most on gravel or whinstone (trap) or rotten fissured whinstone heath and moss yielding a large proportion of pasture land and in the level we have soil generally speaking - thin earth, gravelly, often on a till bottom, with loamy hollows. Towards the Loch there is rock deeply overlaid with moss, sand, gravel or clay.

In Lochwinnoch we have a rainfall above the average. It is very much the same as that which falls at Largs. Compare the following tables as to rainfall.

Years.	Dalkeith.	Bothwell Castle.	Glasgow.	Largs.
1809	23.552	24.440	25.132	38.624
1810	25.636	25.010	21.433	38.714

also

average for Lochwinnoch - from years 1827 - 1897 and taken from records at Castle Semple Station height 240 feet - is 48.87 inches. It is thus a little above Largs, and from these figures it will be seen that more rain falls here than in Glasgow, but comparing this with the annual rainfall at

Lancaster	which is	40.3
Manchester	- -	43.1
Kendal	- -	61.2
Keswick	- -	70.6

it will be seen that Lochwinnoch is worse in this respect than Manchester, but not quite so bad as Keswick. However, Lochwinnoch climate is moist. The quantity of rain which falls is perhaps not quite such a dread as its frequency.

The houses are, for the most part, one or two storeyed and are built along either side of two long broad streets which intersect almost at right angles. They are built single or in Tenement fashion.

From the Census Abstract of 1891, one learns that the average number of Persons Per Inhabited House is 4.1, of Rooms Per Inhabited House is 2.9, and of Persons per



thousand Rooms 1411. The village is a little more congested now so that the next Census will show those figures slightly changed.

The population of the village including Howwood is 2689 and of the Parish a little over 3000. The people are employed in Cabinet or Silk Works. The bulk of the people in the village are in such employment, the rest follow agricultural pursuits.

There is a good water supply but as yet no definite drainage scheme exists. The drainage might be described as consisting of street gullies which at stated intervals run into Cesspools and these ultimately form three little streams or ditches, two of which empty themselves into the Loch and one into Calder. We are meanwhile content also with the Common Privy and Ashpit removed at a proper distance from the houses. A good deal of refuse matter is thrown into the gullies or roadways in front of the houses, to thwart the evil effects of such a practice as much as possible these Common water-ways are flushed and swept and the Cesspools cleaned at least once a week. Such is a short resumé of the features of Lochwinnoch.

A very good criterion of the healthy sanitation of a town or village is the healthfulness of its infantile population.

In Diarrhoea we have a condition which is peculiarly prevalent in and fatal to infants.

In B.M.J. March 13, 1880, and at p. 400 - the mean death rate for the years 1847-78 is recorded as follows.

15 - 25 years of age death rate from Diarrhoea only

.04 per 1000 living at that age

5 - 15 a little greater.

25 - 55 years of age only .1 per 1000 living at that age

2 - 5 .6 -

over 55 1.2 -

During 2nd year of life 5.1

During 1st - 17 living at that age.

Also in the eight Principle towns of Scotland in 1898 one reads from the Registrar General's returns that the Deaths from Specific Febrile or Zymotic Diseases numbered 5004, of that number 1108 were Diarrhoeal. Of this number 908 occurred in children up to 5 years of age.

Dr. Green, Gateshead, B. M. J. Ap. 29, 1882, p. 632 says In England 15 deaths occur in every 100 infants in 1st. year (of Diarrhoea).

It is recorded that in London 72% of all fatal cases of Diarrhoea occur in the 1st year of life, of my 80 cases 50 were of children up to 12 months, the others from 12-24 months. These figures show that the subject is an

important one. They also show that infants are very



subject to Diarrhoea and it is especially fatal to those under one year of life.

Before going further one might note that the Alimentary Canal of the child is a long tube composed of a series of organs of similar functions and sympathetic in their duties one to another; so much so that should any part of it become deranged it affects the whole or part thereof. Some of the digestive juices are practically inert others are feeble in action. The salivary glands are feeble in Amylotic action till nearly the 6th month and the juices of the stomach are also feeble. Moreover it would seem that the stomach pretty nearly acts as a reservoir and that the bulk of the food is digested and rendered fit for absorption in the small intestine and the action there is helped greatly because of the weak peristaltic action of the bowel and the relatively long alimentary tract, thus keeping the food longer in contact with the resolving juices. I have compiled the following table from Ballantyne's "Introduction to Diseases of Infancy" because I think it is very appropriate and that it may help to show at a glance the actual conditions which are at work in infantile digestion.

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Digestive Juices. Ferments in them.	Action on Food Material.
<hr/> Saliva                      Salivary Diastase or Ptyalin	1-7 mos. Food not much altered in mouth up to 3 mos. buccal se- cretion small, after this great- er. It is how- ever distinct, slight at first getting better.
<hr/> Gastric                      (a) Hydrochloric Acid. Juice                      (b) Pepsin (c) Lab. Ferment	Saliva continues action in stom- ach till Hydro- chloric Acid com- mences change Proteids into Peptone in Acid Media.  In absence of Hydrochloric Acid at first have organic Ac- ids E.G. Lactic Acid.

Note here

Milk taken, find lumps of Casein, parapeptone, Lactic Acid (trace), and then appear Hydrochloric Acid and peptone. Casein and Parapeptone disappear as digestion completes. If boiled milk given, peptones appear earlier, and complete digestion hastened.

Again Peptonising power of pepsin hindered, if water is not present largely.

(Reichmann)

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Pancreatic Juice.	(1) Trypsin	) Present	(a) Proteids into
		) 2-3 mos.	Peptones alkali-
		) but	line Medium and
	(2) Amylopsin	) feeble even	neutral (not
		) at end of	for some months)
		) 1st. year.	
	(3) Steapsin	) Early.	(b) Starch into sugar
			(fat emulsifier
			and decomposer
			this one is
			present early).

---

Bile	?	(Stimulates peris-
		( talsis and In-
		( testinal secre-
		( tion.
		(Antesepic

Action on Starch  
slight

Emulsification of  
fat slight.

---

Intestinal	Similar to	During early months
Juice	Pancreatic Juice	not great.

---

Thus we see that although the "secretions" are established the action is slight. It is interesting to note that the more the dilution of the food, the easier is the absorption, and also the fact that boiled milk seems to hasten the completion of the digestive process.

The Intestinal Juices are very much helped in their action by the relatively long and feeble action of the alimentary tract, so that the intestinal action is prolonged. This action is very much similar to that of the pancreas and now the Chyme is converted into Absorbable Chyle which passes as nutritive fluid, into the system, through the vascular connexions of the small and large intestines as Peptones, Sugar and Fats.

Looking carefully into the above conditions that maintain throughout the alimentary system of the infant one can readily see, that the least possible carelessness in infants' feeding will readily give rise to symptoms of Indigestion. Alterations in quantity, Imperfections in the quality of food, also Conditions of Indigestibility either dependent on physical or chemical conditions of the food itself, or of the digestive fluids will give rise to Indigestion; and this Indigestibility leads to retention, and then to the results of retention viz. chemical changes, and putrefaction going on in the stomach and bowels, under the influence perhaps of warmth, moisture, air, &c. Irritation is produced and Dyspepsia

and Diarrhoea result. Moreover the size of the child's stomach warrants carefulness.

Ballantyne indicates the gastric capacity in this table

In 1st week	stomach capacity is 1	oz	) Period of
4th	"	$2\frac{1}{2}$ oz	) Rapid
8th	"	$3\frac{1}{5}$ oz	) Increase.
12th	"	$3\frac{1}{2}$ oz	) Period of
16th	"	$3\frac{4}{7}$ oz	) slow
20th	"	$3\frac{3}{5}$ oz	) Increase.

HOLT found that at birth cubic capacity of stomach might be equal to one ounce and that it increased at rate of one ounce a month during the first 3 months.

From 3rd - 8th month the rate of growth equal to half an ounce per month.

From 8th - 14th month about a third of an ounce per month.

As the gastric capacity of infants will vary no doubt in different individuals I think the method of Rotch is most original and instructive, that of weighing the children before and after nursing. By noting the gain in weight one can approximately determine the gastric capacity, and if this method were employed in a number of children of distinct ages, one could get an idea of the gastric capacity for each age, one would of course have to make provision for the child's appetite and this would open up a fallacy in the results.



However I think that the tables already quoted give one a very fair idea of the actual size of a child's stomach and should afford practical proof that the amount of food given to a child should be provocative of great care and discrimination on the part of the nurse and physician.

Of the 80 cases of diarrhoea observed by me only five occurred in breast fed children. This is to be regretted, but the fact remains that there is a widespread and increasing antipathy on the part of mothers to suckle their infants. The essential nourishment of a child consists of albuminates, Lactose, Fats and Salts - milk contains nitrogenous matter in curd, fat in the cream also sugar and salts :-

In the milk of the mother these elements are combined in exactly the proportions best adapted to supply all the wants of the child's system. It should be the natural food of a baby at any rate for the first ten months of life. The mammary gland is a self-regulating organ as to the amount of food it will elaborate at a given nursing. Should it happen to be called upon to nurse twins it will increase the amount of its supply. It will also in the majority of cases produce the amount necessary for the infants small or large gastric capacity. Sometimes, however, influences which affect the mother may affect the child at breast e.g.



One of my cases was that of a female infant of 3 mos. It resided with a Father and Mother and four other children in a three roomed fairly comfortably furnished and clean house. The Father had a strumous history but the Mother was fairly strong, of an easy-going disposition, eating and sleeping well, taking exercise and also devoting proper time to nurse the child. For a week, however, the child had not been well and was fretful, at first somewhat constipated, now the motions were frequent.

On inquiry I find the Mother has been for that time and is still menstruating slightly.

The child looks distressed, tongue whitish fur, but clean round edges. No teeth. Muscles soft. Cries a good deal and moves the legs on abdomen.

The Temperature is normal.

The Pulse is 135 in the minute.

Heart and lungs are normal.

The Abdomen is painful on palpation but there is no unusual hardness or tenderness found anywhere over it.

There is no vomiting.

The stools are 6 in the day and to appearance are green ill-smelling stools with whitish particles like undigested milk scattered through the mass.

I had the breast of the mother well cleaned and washed anteseptically and removed about 28 c.cm of milk therefrom into a clean bottle and sent it to the clinical

Research Laboratory in Glasgow for Analysis, and to determine which of the essential elements was deficient. The Report was sent duly and read as follows.

(1) An exact determination by weight was made by the Werner-Schmidt process. The result gave

Fats as 2.37% by weight - only 55% of normal good human milk -.

(2) The Lactose - estimated orhemetrically after precipitating the Casein and Fat by Ritthausen's method.

Result = 5.6% by weight  
- rather below the normal of good milk but not reduced to same extent as fats -

(3) The Proteids - Estimated by weight by Ritthausen's process

Result = 3.76%  
- Rather above the normal, but possibly this is due to some experimental error, at all events it indicates that the proteids are not at all decreased -.

It will be seen that this milk is distinctly poor in fats and also below the normal as regards lactose by comparison with a normal human milk which reveals

Fat	from	3 - 4
Sugar	-	6 - 7
and Proteids	-	1 - 2

This infant then had meanwhile been kept from the breast for 8 hours and during that time the mother used the

breast pump. The child was given a little grey powder with rhubarb and Soda. It was also given a little barley water and frequent little drinks of fresh water which had been boiled and cooled. Though the mother had not quite stopped menstruating, still at the expiry of the 8 hours the child was put back to the breast. The child got better and the stools improved in appearance and of normal frequency.

At the end of the 4th day the child was reported well. Emotion on the part of the mother may also affect the milk. It can be increased by ingestion of gruel, milk, and coffee. It can be diminished by drugs, such as Potassium, Iodide and Belladonna and saline Cathartics. Human milk as it gets older gets richer in curd and cream e.g. Wet nurse whose own child is much older than adopted one. Such a milk will cause Diarrhoea in the adopted child where the fat is above the standard there the digestion will be weakened and there will be a tendency to diarrhoea.

Another case of a child 5 mos. old in which there was a previous tendency to diarrhoea. The stools were eight in the 24 hours. The child being nursed every 3 hours night and day.

A specimen was sent in the same way and with the same precautions and the report indicated the

Fats	at	3%
Lactose		6%
Proteids		4%

This child was stopped from the breast for 8 hours during which time the breast pump was used. A little grey powder and Rhubarb was given the child and frequent little drinks of the fresh cool boiled water.

The mother's diet was regulated so that she took more meat (flesh) and exercise out of doors (after the teaching of Rotche).

The child was put back to the breast, although the bowels were frequent nothing was given but four grains of Bismuth subnitrate in the 12 hours, and the little drinks of cooled water.

By persevering with the breast and the attention to diet and exercise on the part of the mother. On the tenth day the child was well and taking the breast in a satisfactory manner.

The milk of animals differs a good deal in constituent nutritive parts from woman's milk e.g.

Cows milk contains a larger proportion of curd and cream, but less sugar than human milk. The density of the clot formed by the curd of cows milk is greater than the clot formed by the curd of human milk which forms a light loose flocculent clot readily disintegrated and digested in the stomach. The gastric juice

does not prevent the clot of cows milk although diluted from being dense. The particles of Casein still run together into a solid compact clot and children often pass masses of hard curd by the bowel. Compare the following table

Milk	Casein	Butter	Sugar	Salts
Human	2.7	3.5	5.0	.2
Cows	4.2	3.8	3.8	.7
Ass	1.7	1.3	4.5	.5
Goat	2.87	5.13	4.69	.87

The milk of the Ass will thus be noted pretty nearly equal to the composition of Human milk and is more digestible than Cow's milk. Moreover the milk of the goat is very rich in fat and as far as curd is concerned is intermediate between Human and Cow's milk. Still it is more digestible than Cow's milk and this is due to the looser clot formed in the stomach.

There is no carbo-hydrate present in human milk except Lactose. Almost all condensed milks and patent foods in the market contain an excess of carbo-hydrates generally either starch or Cane sugar. Pancreatic Fluid has no effect on starch (or slight) till after the third month and salivary secretion is scanty. Digestion of starch chiefly depends on these two. Starchy food used too early as infants foods are bad because such



foods often ferment and generate an acid which irritates the delicate mucous membrane and increases the disturbance of the digestive organs. So that excessive and irregular feeding, Indiscriminate feeding, unwholesome food, badly prepared foods are causes at work in producing diarrhoeal disorders in infancy.

I might tabulate the dieting observed in my 80 cases as follows

Mother's Milk	5	Cases.
Mellin's Food	5	"
Horlick's Milk	2	"
Nestle's Food	3	"
Cows Milk only	25	"
Cows Milk and other diet	23	"
Practically adult dieting	<u>17</u>	"

80

If this condition of improper food administration is long continued and the consequent intestinal irritation kept up one meets with a diarrhoea in infants which undergoes and drags a chronic course, e.g.

J. D. male 10 mos. only child living with his parents and two Aunts in a 6 roomed house of moderate comfort and internal arrangement. His diet consisted of Cow's Milk (equal parts milk and water) one bottle of such thrice daily. Also getting "picks" at table, and an egg beat up with milk once a day. Former health of



this child fairly good. When 2 months old he had a Bronchial Catarrh and when he cut his first two incisors at 8 months he had a little diarrhoeal disturbance and was generally fretful.

(Apr)  
( 2 ) At present he is a delicate looking boy inclined to be rickety. Four incisor teeth are present no evidence of any more and no tenderness of gums. Tongue dirty with central brown fur. The child is ill looking. His face is white and eyes sunken. He is peevish and cries a good deal.

Temperature in rectum is  $101^{\circ}$  and his pulse is 150 in the minute.

There are no abnormal signs in Heart or Lungs.

His abdomen is hard all over and tender to palpate.

At first he vomited three times, but now does not. He passes a motion every 2 hours, which is liquid smelling and of a greenish yellow colour.

The treatment adopted here was to stop all food for 24 hours. The child had a preliminary Powder of

*By Hydrarg & calca ft  
Sot Bicarb ft  
P. R. R. ft*

He was sponged all over with lukewarm water and had frequent little drinks of cool sterilized water given him.

Next day temperature was  $99^{\circ}.6$ . The child was more

cheerful but the motions were still frequent. I ordered him to have Barley Water from a bottle (feeding) and powders as follows

*gr Lod. Sal gr i  
Bis. Subnit gr ii  
P. Opone. Co. gr i*

one every 4 hours

a poultice was placed over abdomen and this changed three times in the day.

On the 4th day of illness temperature was 98° and the stools were 6 in the day of better consistence. The child was still taking the barley water and agreeing with it.

5th day stools 5 in the day, child bright and better, but mother thinking he was starving gave him some Mellin's Food prepared in a feeding bottle. The result of this was disastrous. All the symptoms returned but with careful nursing and judicious dieting with meat juice and thin well strained chicken soup and cool sterilized water with the assistance of Salol powders in *gr i* dozes every 4 hours by the end of the 5th week this child became convalescent.

During the 8th week he was able to take some sterilized cow's milk in a feeding bottle. This agreeing with him was continued.

A belief prevails amongst mothers that when a child is "getting teeth" the diarrhoea which may disturb it then

is practically a safety valve and were the child not to have diarrhoea then it might be subject to "brain trouble or disease of the chest". This belief is responsible for many nasty diarrhoeas in children. 30 of my cases showed evidence of teething with the diarrhoeal conditions I was called upon to treat.

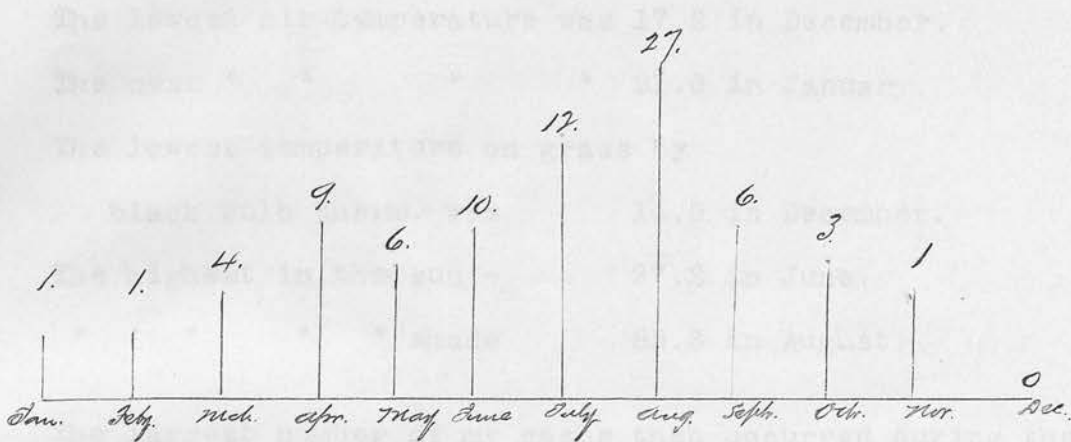
In 12 incisors had completed or were in  
process of eruption

- 8 Bicuspids were in process.
- 5 Canines.
- 5 Doubles.

At this time changes may take place in the dietary and because of this Intestinal disorders may arise which may interfere with the process of teething or be themselves intensified by such changes going on in the mouth. The Intestinal surface and its glands have all the sensitiveness of parts undergoing rapid development. Perhaps at this time the child is more susceptible to feverishness and this may end in chill and so in intestinal derangements.

The motions in those 30 cases were of a more watery nature.

The table I now insert here shows the distribution of my cases with reference to the months of the year.



The greatest number practically occurred in the middle third of the year reaching their highest point of excess in August. Referring now to the annual resumé of the Registrar General for Scotland August had the greatest excess of calm weather.

January was characterised by a mean humidity higher than any recorded since January 1875 and a very large mean rainfall 21 days. Its mean temperature being 38.3. Then

Month.	Mean temp.	Humidity.	Rainfall.	days.
Feby.	40°	91	0.97	& 15 of it.
Mch.	42.6	84	2.27	18 -
Apr.	45.3	75	3.31	23 -
May.	48.4	72	4.12	13 -
June	60.2	73	1.55	12 -
July	61.4	81	2.70	17 -
Aug.	62.8	80	1.12	11 -
Sept.	54.6	79	4.04	26 -
Oct.	49.6	85	3.14	19 -
Nov.	47.9	84	5.07	22 -
Dec.	36.6	89	2.81	19 -

The lowest air temperature was 17.2 in December.

The next " " " " 21.0 in January.

The lowest temperature on grass by

black bulb therm. was 14.5 in December.

The highest in the sun - 97.2 in June.

" " " " shade 85.3 in August.

The largest number of my cases then occurred during the hot season of the year and during this period occurred two deaths, the only deaths in my series of cases from this condition.

It is true that people are very much affected by their surroundings. Again the majority of these cases on mine at this quarter of the year, those of the severest symptoms occurred in the most unhygienic parts of the village. In a tenement on the low level of the village past the end of which and at only a distance of about 20 yards ran a sluggish ditch composed practically of liquid sewage. Also in a tenement of houses at a higher level in the village near which a similar condition maintained. Again in these tenements the average accommodation was one room and the average number of people therein accommodated was four. Again the Autumnal diarrhoea of this County is pretty closely connected with temperature and usually commences when the thermometer is persistently about 60° and when there is at



the time a scarcity of rainfall.

It has been checked in some of the big towns by a heavy rainfall

In Greenock 4.40 in rainfall temperature 59.2 of 117 cases in August only 5 deaths from Diarrhoea

In Dundee 1.75 in rainfall and the temperature 59.8 and of 254 cases of Diarrhoea there were 50 deaths.

While in Glasgow in August with a rainfall of 3.66 in and a temperature of 59° out of 1268 cases there were 89 deaths.

Dr. Charles Green of Gateshead thinks that Heat acts in two ways.

"(1) It probably relaxes the tone of the system and pre-disposes to the disease.

(2) It principally acts by assisting the process of fermentation in Ashpits, deposits of rubbish, sloop pools, &c., which surround the greater number of patients who suffer from this disease. Heat also acts in assisting the fermentation of milk and other food kept under insanitary conditions and food that has begun to ferment almost always causes diarrhoea."

Sanitation affects children markedly, air space, ventilation, drainage situation, general home-cleanliness and water and milk supply. All these united to atmospheric changes will cause this diarrhoea so frequent in



hot months. In Health of Towns Report Vol. 1 page 139, a case recorded at Clapham where the cleansing out of a privy produced in 23 children violent vomiting and purging, headache and great prostration and convulsive twitchings of the muscles 2 died in 24 hours.

Dr. Duncan in Health of Town Report Vol. 1, p. 131, indicates that density of population usually implied poverty and insufficient food and unhealthy work, but its main concomitant condition is impurity of air from overcrowding, and illustrates his remarks by this table

Population to one square mile in districts taken in England .	Deaths per 1000 per annum.
56	15
106	16
144	17
149	18
182	19
202	20
220	21
324	22
485	23
1216	24
1262	25
2064	26
2900	27& upwards

and he continues that admitting that several causes are acting here, the increase in above table is so regular as to lead to the belief that one grand condition must be dominant.

It would seem however that cool and wet weather in the

height of Summer is much more favourable to the health of infants in this respect.

The Foetal intestine is sterile at birth.

Infection by mouth and rectum quickly occurs and almost every form of Bacteria may be found in the discharges but chiefly such forms as

Proteus vulgaris as substitution  
of food takes place, such Bacilli as

Bacillus lactis Aërogenes

Brieger's Bacillus (Rotch)

In the healthy nursing child two species of Bacteria are said to be found in the intestine constantly

Bacterium lactis Aërogenes

Bacterium Coli Commune

The former inhabits the small intestine. The latter lives in the colon and lower part of the ileum.

In Summer heat these organisms swarm and multiply.

Milk is a wonderful medium for their growth and active development, and this article of Commerce is depended upon by infants for sustenance so that it is not to be wondered at why so many children are afflicted with diarrhoeal conditions especially in Summer weather.

Rotch says "Although human milk is usually considered to be sterile, except in cases in which the woman is diseased yet Cohn & Neumann have examined the milk

of 48 healthy women and have found Bacteria - mostly Staphylococcus pyogenes albus and a few Staphylococcus pyogenes aureus and streptococcus pyogenes - in 43 cases.

In my two specimens of humanly fed infants in August, with antiseptic precautions I drew about 28 c cm of milk from the breast of the mothers and sent them to the Clinical Laboratory in Glasgow for cultural examination and particularly with reference to the presence of unusual organisms. Unfortunately no cultural examinations of the specimens were made because of the appointment of Dr. Buchanan - to whom the specimens were sent - to a new position as Bacteriologist to the Corporation. He however sent me this report, "Your specimens were duly received and have been subjected to microscopical examination, but without any very definite result. The number of Bacteria in the specimens is large. I can only say that no organisms of an unusual kind or character appear to me under the microscope."

On the other hand Cow's milk is practically sterile when drawn from the healthy udder through a sterile canula. When sold to customers it is acid and is crowded with micro organisms.

The 25 cases of children fed on Cow's milk which I saw in August, had a sharper and more prostrating diarrhoea

than those which occurred in July. Moreover they all became ill about the same time and were seen by me within a period of **four** days.

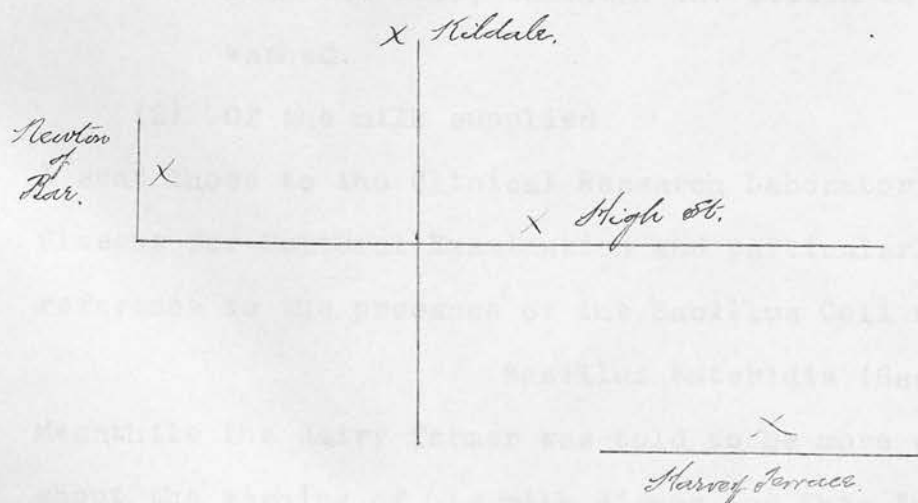
10 of these cases occurred in Harvey Terrace a tenement within 20 yards of the largest ditch which forms part of our primitive drainage scheme.

5 were seen in Kildale - another well inhabited and dirtily kept tenement at a higher level however in the village

3 were ill in Newton of Bar, and

7 in High Street.

The following diagram may show the distribution roughly



On investigation I found that the milk supply to all these families had the one source of origin; that of a small dairy farm house at the other end of the village. Five cows of the hardy Ayrshire breed were kept at this place and the milk taken to the village every morning in a wooden "butt". The byre space at the farm was limited and stuffy, but the cows were well fothered and cared for and had a good supply of food and fresh water. I also found that this wooden vessel in which the milk was taken to the village was carefully scrubbed and washed on its return. However on two occasions - prior to my cases - this wooden vessel had been carelessly washed in a "well" of water near the house before the milk had been put into it for delivery in the village. I collected two specimens of about 28 c cm each.

(1) From the Well, in which the wooden vessel was washed.

(2) Of the milk supplied.

I sent those to the Clinical Research Laboratory in Glasgow for Cultural Examination and particularly with reference to the presence of the *Bacillus Coli* and the

*Bacillus Enteridis* (Gaertner)

Meanwhile the dairy farmer was told to be more careful about the washing of his milk dishes and this "well" was closed up.

I received the following report

"The Bacillus Enteridis is not present in the milk or in the water."

"The Bacillus Coli Communis is present in both but very largely in the water. The water shows undoubted evidence of sewage

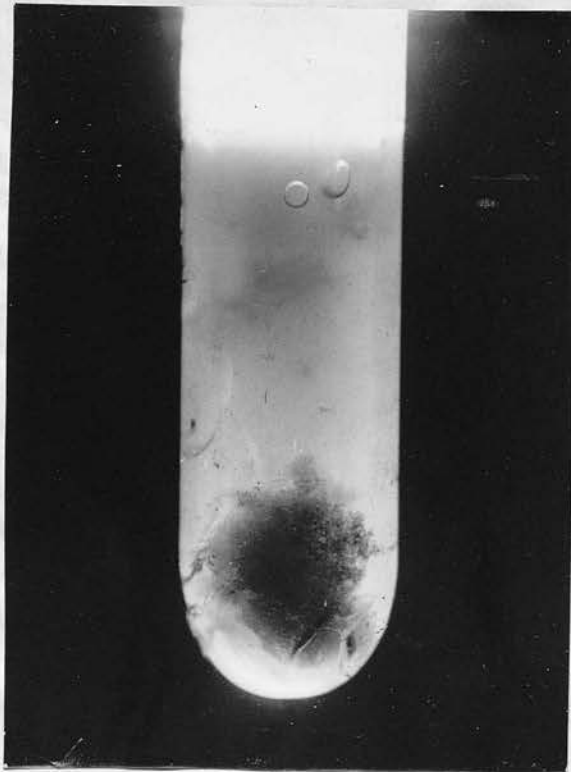
contamination."

From this specimen of water I obtained four living culture tubes of the B. Coli Communis in various media. These specimens I photographed with an ordinary Horse Shoe Camera, giving a 3 second exposure.





This Photograph is enlarged double size and shows a stab culture of the *Bacillus coli* in Gelatine. This specimen shows the production of gas in the form of 'Bells' in the media.

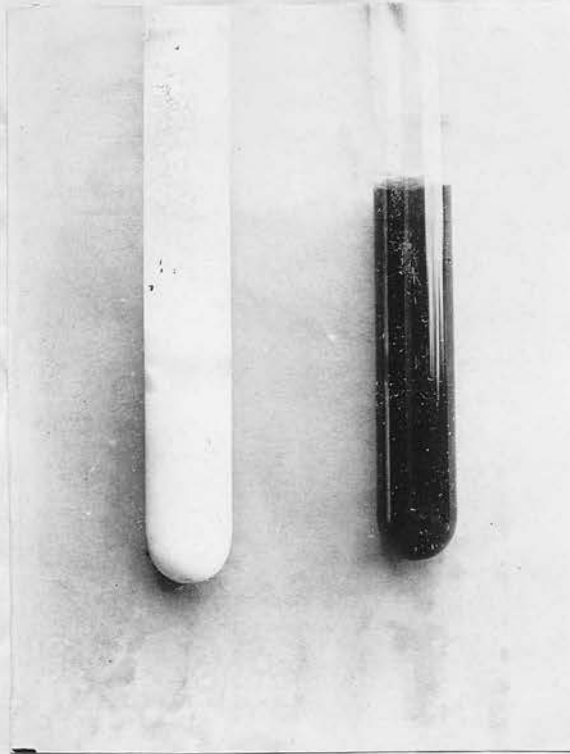


This is a photograph enlarged twice. It is a culture of the *Bacillus Coli* in Agar. This specimen shows also the production of gas in the form of "bells" in the media

"A"

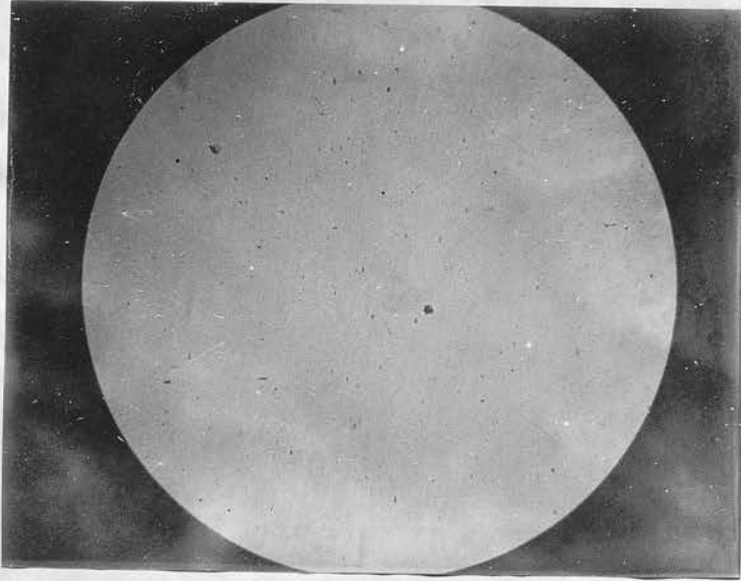
"B"

32



The specimen to the left A is *Bacillus Coli* in milk, in which it produces coagulation. This probably depends on the fermentation of the lactose of the milk, and the throwing down of the Casein by the resulting lactic acid.

Specimen B. *Bacillus Coli* in Broth, to which has been added Lactose and Litmus; the former is converted into Lactic Acid by the growth, and this changes the colour of the Litmus.



This is a slide specimen of the *Bacillus Coli Communis*, in which the organisms are stained with methyl violet. This specimen I photographed from my microscope which magnified X500. It is however not very distinct. Muir and Ritchie, in their *Manual of Bacteriology*, 2nd. Edition, page 176, says that the virulence of the organism *Bacillus Coli Communis* varies much. It is found in a great many inflammatory and suppurative conditions, in connection with the alimentary tract, and they add, "In certain cases of Enteritis it is probably the causal agent though this is difficult of proof, as it is much increased in numbers in practically all abnormal conditions of the intestines."

The fact of the organism being found in such large numbers, so great as to condemn the water in which the milk vessel was rinsed preparatory to the milk being sent to the village and of the same organism being found in the milk as supplied to the cases before indicated: augurs pretty well for the diarrhoeal conditions met with to be the result of its activity under such agreeable conditions - conditions favourable to its development -.



In speaking of the Classification of Diarrhoea, one finds the subject complicated.

Books speak of endless varieties, such as,

Inflammatory Diarrhoea

Nervous -

Mucous -

Febrile -

Crupous -

Dysenteric -

Ulcerative -

Lienteric -

Many of these names suggest themselves at once and seem to have arisen as descriptive of the motion passed, whilst others are named on an anatomical basis.

Rotch says (page 836-88) "that a classification of those diseases on a pathological basis has been proved to be inadequate -. He further says that serious symptoms during life are often proved at the autopsy to have been produced by no pathological lesion, while grave lesions may be found at the autopsy where the intestinal symptoms during life were very mild.

In the British Medical Journal, Dec. 1882, p.1156 Dr. Windle showed stomach and portions of intestine from the body of a child that had died in August of that year of Infantile Diarrhoea. Numerous ulcers often aggregated together and the size of peas were found

especially in the lower part of ileum. In the stomach there were shallow ulcers one-third of an inch in diameter with raised and reddened edges.

In my series of cases I had two deaths, and one of these occurred in August. In this case only was I granted a post-mortem examination and that merely of the abdomen.

The case was as follows:-

J. F. male 8 months old, living with his parents and another brother in a one-roomed house fairly comfortable. He was fed on cow's milk, the bottle was cleanly kept, and the child's clothing fairly comfortable. The child had a bottle every three hours and it was composed of equal parts of cow's milk and water with a teaspoonful of sugar.

The child's former health was good.

He became fretful the day before I saw him, vomited twice and purged six times with evident pain, but took his milk greedily until the day I saw him.

Present state- Child lies on mother's knee, pale and ill looking. Face pinched and eyes sunken, fontanelle depressed, temperature  $103^{\circ}$ .

Breathing is quick and shallow, but Heart and Lungs are normal.

Pulse 160 in the minute soft.

Lips dry, two upper and two lower incisors and the gums about lateral incisors are red looking. Tongue dry,

brownish fur down centre and three small ulcerated patches on right margin.

The abdomen is tense and tender to feel causing the child to cry. There is no localised tenderness and no enlarged glands.

No oedema of face, body or ankles.

The motions are twelve in the 24 hours, watery and smelling.

#### Treatment.-

All milk stopped, child sponged over with hot water and put into cradle.

The feet and hands were kept warm and one teaspoonful of water was administered every hour, in which was 3 drops of brandy.

The bowel was irrigated with cold sterilized water from a fountain syringe once.

A powder of 1 gr. Salol and 3 grs. Bis. was given every 3 hours.

In six hours afterwards the temperature was  $101^{\circ}$  and the child had a little cold chicken soup, the brandy and water being continued. The motions were not quite so frequent, one every 3 hours.

Next day the child was in a collapsed state. Motions passing every 3 hours still. Everything was done to stimulate and the irrigation of the lower bowel with

cold water adopted twice a day.

On the third morning, the child had one copious motion and afterwards began to twitch about the face. He then convulsed and died, temperature being  $99^{\circ}$  in the rectum. Post-mortem of abdomen eight hours after death.

The body was emaciated.

Rigor mortis not present.

The eyes were dull, and covered with a little mucus.

The skin was pale and dry and shrivelled looking and the mucous membranes were ex-sanguine at the natural orifices.

An incision was made through the abdominal wall in the centre right into the cavity of the abdomen.

The organs were examined in situ.

The liver was normal.

Stomach appeared small and contracted, and only contained some slimy mucus.

The Intestines were small and of a pale purplish colour.

The Rectum and Colon being rather more injected.

The whole Canal was empty, with the exception of some mucus.

This case did not reveal anything characteristic.

Others who have recorded Post-mortem examination of cases, which have terminated fatally have had revealed no change at all.

But, again, Dr. Lewis Smith of New York found - in 80 out of 81 cases Post-mortem examinations - inflammation of the colon.

In 18 of these the mucus membrane was ulcerated. Part of the colon most affected he found to be that part immediately above the Sigmoid Flexure. The solitary glands of large and small Intestine and Peyers Patches, he says, are involved in nearly all cases of the disease. But Dr. Smith found the Liver to be but little affected.

The classification then, of these diseases, on a pathological basis being inadequate, the, etiology of these diseases from a Bacteriological standpoint is also incomplete, so that it might be more practical to classify them as

- (1) Dyspeptic and
- (2) Infective.

This ailment may be of all grades of severity and between these several forms, no very sharp line of demarcation can be drawn because a child with a very slight form of diarrhoea, if neglected, may develop a more serious form because of some constitutional weakness and because its intestines are subject to increased bacterial invasion at any time.

Of my 80 cases 25 might be said to be due to the



increased activity of the *Bacillus Coli* acting under favourable conditions, such as heat, insanitary surroundings, &c., and these cases might be classified as Infective in origin.

The other 55 cases were practically different grades of severity, of Dyspepsia, and might be classified as of Dyspeptic origin.

My Dyspeptic varieties were of a simple and of a more acute grading. All, no doubt, due to improper, excessive, irregular or unwholesome feeding, which, when corrected, bettered the simpler cases. The other cases of this class more acute and prolonged were probably the result of increased fermentative changes in the food from the toxic effects of Bacterial organisms. Of my 55 cases of this class 20 were of the simple variety. Three of these were breast fed, the others were fed on Cow's milk or foods, as Mellin's or Nestle's. The chief symptoms noted were,

- (1) Wakefulness or peevishness.
- (2) Abdominal discomfort, but no actual pain.
- (3) Stools numbered from 4 - 8 in the day, and were of a yellowish green soft consistence, offensive and curdy.
- (4) In 15 of these cases the child vomited.
- (5) The general appearance was pale, eyes rather dull, and the skin was dry looking.

### Illustrative Types

(a) Breast fed infant, Male, 8 months, living in a one roomed house, fairly comfortable.

Parents both strong. Mother has a happy temperament, sleeps and eats well, and is a general housewife and has a desire to nurse child.

The child's temperature is not raised.

Pulse beats 136 in the minute.

Heart and Lungs normal.

The child is pale looking, and is fed about every 3 hours, night and day, somewhat peevish, but sleeps fairly well.

The abdomen on palpation creates discomfort, but child does not cry. It is soft to palpate.

Stools are six daily, and of green, sticky consistence, and offensive, showing undigested milk.

The child vomits milk curdled.

(b) Infant, Male, 6 weeks. Cow's milk. Only child and living with parents in a 2 small-roomed, poorly furnished house.

The mother is anaemic, but able to attend to duties.

The child lies in cradle, and is of a rickety development. The tongue has white fur.

The temperature is not raised.

Pulse beats 138 in the minute.

Heart and Lungs are normal.

The child has a pale pasty look. He is fed every two hours, and the milk is made in the proportion of one part Cow's milk to 3 parts of water, and sweetened.

The child sleeps well, but seems to have evidence of slight pain after drinking bottle.

Abdomen is hard to feel, but no tenderness. The stools are 5 in the day and of soft greenish consistence and offensive.

The child vomits occasionally curdled milk of a sour smell.

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The other 35 cases ranged in ages from 10 months to 24 months.

30 of these were more pronounced as to symptoms, and five had a protracted course.

18 were fed on occasional drinks of farinaceous foods Cow's milk from a bottle with picks from the table.

17 had practically adult dieting.

The most noticeable symptoms were,

- (1) Crying and general irritability.
- (2) Pain in abdomen, indicated by twisting movements of body and legs. It seems to be most intense just before a motion is passed.

- (3) Sleep is reduced to a minimum. The child may fall asleep, but it wakens up startled .
- (4) Stools are more frequent, having at first a consistence, they pass to become slimy, and watery, but still smelling, and of an average frequency of ten in the day.
- (5) Thirst is general.
- (6) Appearance of Infant. The eyes are dull and have a ring of blackness.  
The Fontanelle is depressed and the skin is dry, and the child seems to be losing in flesh.  
There is redness of the buttocks.
- (7) In some cases vomiting, but the breath is badly smelling.
- (8) There is a raised temperature.

#### Illustrative Cases.

- (a) M. H. Female 11 mos. Still getting drinks of cow's milk from bottle, but also an egg beat up with bread crumbs.  
Living with 1 brother and 2 sisters and parents in 2 roomed (large) house, but family are dirty in habits and careless. They all are of strumous constitution.  
However till present time this child was healthy.  
She has only 4 incisor teeth. Two days before I

saw her, the child had vomited and was cross and wakeful and restless and cried after getting fed. The motions also were frequent.

Present Condition.

Child in bed.

Temperature 101°.

Pulse 150.

Pained and fretful, anxious expression

Pale, thin, Fontanelle depressed and Jadelots line are noticeable especially at corners of mouth. Skin is dry and the flesh soft.

The breathing is regular, but increased.

The lips are well coloured. The gum at seat of the budding upper lateral incisors is red and inflamed looking, and there are one or two little red spots on tongue which are painful.

The tongue is dry with a brown fur.

Motions are 12 in the 24 hours, and are greenish brown and of a semi fluid consistence.

(b)

G. B. Male, 9 mos. 1 brother, 1 sister and parents, living in a one roomed house, comfortable and clean.

Child fed on cow's milk, with pickings from table.



He has had good health, but was always costive and required medicine to make bowels move.

Parents and members of family are strong.

Present illness.

Child in cradle, temperature  $102^{\circ}$  in rectum.

Pulse 160.

Well nourished child, but muscles soft, and he is evidently 'losing'.

He has 2 lower incisors, but no appearance of other teeth.

Tongue dry with a thick fur.

The child lies quiet, is sick and does not take his bottle.

Nothing abnormal in heart or lungs.

The abdomen is full and painful on pressure, and when palpated deeply causes child to vomit. No localised tenderness or swelling.

The child has a motion every hour, which is dark brown with a greenish tinge and watery. In some I noticed a streak of blood.

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Five of this group of cases were of a more protracted nature keeping on for from 4 - 8 weeks.

In these the symptoms were more marked.

(1) Emaciation was pronounced and Jadelots lines were evident. The flesh was flabby and the skin shrivelled looking.

(2) Stools averaged 8 daily, large motions at first semi solid in consistence, but becoming watery.

(3) Fretting is increased.

(4) These children assumed a Hydrocephaloid state.

(5) Two of them got a little better, but relapsed before picking up finally.

(6) Fontanelle depressed.

My other fatal cases I will record in this category.

The child died after lingering, in all, 8 weeks.

I did not see it till the 4th week of its illness. The mother thinking that the Dr. was not necessary for this case, which she diagnosed as "Consumption of the Bowels"

Present appearance. The child was 12 months old, and had been fed on "food from the table". The child lay in her cradle, and had the following appearance. Upper and lower, central and lateral incisors.

She was pale, and of a peculiar 'muddy' look.

The eyes looked as if they lay in 'hollows' in the head.

The lips were pale and thin and the fontanelle depressed, and the skin was harsh and dry. The tongue was dry and sordes appeared in mouth.

There was no temperature.

The pulse was 128.

The heart sounds were soft, but well closed, and the lung sounds were harsh, but there were no accompaniments with expiration or inspiration.

The abdomen was flattened in appearance, and there seemed to be no pain on palpation.

The stools were 6 in the day, and were "slimy" and contained little masses of undigested food. They were very offensive to smell, and when the motions passed the child cried as if in pain.

Under treatment this child progressed slightly for the next few days.

It was exceedingly difficult to keep the mother exact in the administration of the nourishment, which consisted of thin, well-strained, chicken soup, with some raw meat juice and plenty of fresh cool boiled water with a little stimulant.

The child was eager to take nourishment at this time.

Thinking the child neglected the mother gave it "gruel" to take, and there was a return of all the symptoms.

The diarrhoea advanced, the child lost strength, and became more wasted, the cheeks got hollow and the skin wrinkled.

The stools became more frequent, 10 - 12 in 24 hours,

and were liquid, brownish yellow colour and had occasionally streaks of blood.

The belly became swollen and tense, but still there was not much tenderness on palpation. There was pain at each evacuation of the bowels.

There was no rise of temperature.

During the 7th week a catarrhal condition existed at the base of both lungs. It extended as far as the angle of each scapula. There was a slight cough.

During the days of this week, the emaciation became extreme.

The eyes were deeply sunken in their sockets, and had a dull look and were covered with a sort of mucus.

The cheeks were hollowed, and the skin seemed tight over the projecting bones.

The child lay quiet, with eyes half-closed, but still swallowed nourishment, which consisted now of cold water with a little stimulant and some weak chicken tea.

Jadelots lines were very pronounced.

The Fontanelle was deeply depressed.

The tongue was dry and had a thick fur, and the lips were pale, and both were covered with sordes.

The complexion was earthy looking.

The belly was somewhat distended, but there was no evidence of pain, unless the child passed a motion.

The dullness at the base of both lungs was comparative

but accompaniments of a soft nature were heard at the end of both inspiration and expiration.

The pulse was soft, and counted 120.

The temperature was not raised.

On the 55th day from the first of the illness, the child had frequent twitchings of face and hands, and died, the mother said, "convulsed".

No post-mortem was granted.

The 25 cases which I have grouped under the classification Infective seemed to me to resemble mostly those cases described in text books as

Summer Diarrhoea, Epidemic Diarrhoea, Milk Infection, Inflammatory Diarrhoea, &c., because the nervous prostrations out of proportion to the amount of diarrhoea seemed strongly to point to a definite poison.

Fortunately, my cases did not reach the more intense characters recorded under the class of cases spoken of in text books as "Cholera Infantum", "Acute milk infection", &c.

All of these cases occurred in the month of August.

The chief characteristic was that the child who had been healthy, say, to-day, was seized rather suddenly with vomiting and sharp purging and became sick and "laid" to use a word continually expressed by mothers. Although not of such a collapsed type as observed in

cases of "Infantile Cholera", still my cases only varied in degree and perhaps had they not been seen early and treated would have had disastrous terminations. As it was, one of these cases died.

The symptoms manifested in each case seemed to point to direct absorption from the stomach or intestines of organic poison.

Although 27 cases occurred in this month only 2 were breast fed, the others were drinking cow's milk.

The most important symptoms noted were,-

- (1) Child listless and drowsy, and the eyes are dull, hollowed out. The features are pinched looking. The fontanelle depressed, and the surface of the body, hands and feet cold.
- (2) The pulse is feeble and frequent and thready.
- (3) The Respirations shallow and frequent.
- (4) Sudden vomiting.
- (5) Purging frequent, watery.
- (6) The rapid loss of flesh.
- (7) Thirst is great.

The cases whose symptoms are noted above occurred in children from 3 weeks to 10 months.

There were 10 males and

15 females.

The children were mostly seen in a one roomed house.



Five of them, however, lived in a three roomed house and one case was seen in a house with 8 rooms.

In 10 of the cases the stools numbered from 10 - 14 in the day, and were of a watery mucus character, not smelling.

In 15 cases there were from 6 - 8 stools passed in the day, at first smelling and of semi-solid consistence becoming soon watery.

In all, the temperature in rectum ranged from 100 - 102° the first day.

In the 15 cases the temperature was normal on the 3rd day, and the stools under treatment became less and by the end of the 5th day the children were better.

In the 10 other cases, much more nervous prostration prevailed, and these cases occurred in the one roomed houses, with an average of four people in the room, and the houses and appointments were not clean or methodical.

Six showed presence of teething

Two had tender gums with incisors apparent

Four showed eruption of upper and lower incisors, and one of these cases died.

These cases convalesced in from 8 - 12 days.



Illustrative Case.

Male child J. K. 8 mos. One roomed house, (a small closet off this room in which was a bed might be called a second room).

There were 11 people in all in these apartments including this child.

The child was fed on cow's milk, equal parts with water every 3 hours, night and day.

The bottle was filthy, and so was the child and all his surroundings.

He was a hardy child however, and his former health was good.

He became sick, his mother said, one morning after getting his bottle, and purged 3 times within an hour.

Present condition    Aug. 2.

Child lying in a dirty cradle and in a dirty condition, with the teat of a dirty bottle in his mouth. Teeth 4 incisors.

Temperature 102°.

Pulse 160, soft, feeble.

Breathing quick and shallow.

Feet and hands cold.

Face pale, eyes sunken, fontanelle depressed.

Motions 8 in 24 hours, watery.

The child looks very ill and depressed, and weak.

The urine is not suppressed.

All the organs examined were healthy. The stomach and bowels were tender generally to palpate. There was no localised tenderness and no swelling to be felt in the abdomen.

Under treatment, this child was very much better on the fourth day. He was even then listless and depressed and lay quite feeble in the cradle. However, by the 7th day, he convalesced and became interesting and observant and took nourishment and progressed from that time.

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#### TREATMENT.

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Infantile diarrhoea is not always an easy condition to treat. In many cases, the mother looks upon the trouble in a half-hearted light, and exclaims, "Oh, it's only looseness in the bowels", and she very often does not assist in attending to the orders given, particularly as regards nourishment. In treating all my cases, whether severe or slight, I have kept the four following points always before me:

- (1) To assist the effort which nature is making to free the stomach and intestine from the irritant

or poison which is in them (this continued profoundly affects the nervous system)

- (2) To restore the surface circulation, which, in the majority of cases, is lowered, it produces a great fall in blood pressure.
- (3) To supply water to the tissues, because the loss of water may quickly collapse them, causing absorption of moisture from the tissues, shrinking of the limbs and collapse of the features, depressed fontanelle and a weak and failing heart.
- (4) To support the strength because the diarrhoea, if at all severe, quickly weakens the child and drives it onward into a state of collapse and general exhaustion.

In every case the child was placed in the most suitable and favourable surroundings. In an airy, comfortable room, when available, and, if not, fresh air and cleanliness were enforced in the apartment. The child's cot was changed and fresh linen provided - in carrying out and enforcing these injunctions I was greatly helped by the Jubilee Nurse of the village.

The child was kept warm and had fresh clothes put on after a warm sponge was administered to the body.

A poultice, or, in milder cases, a warm flannel bandage was applied to the abdomen.

Irritations or excoriations about the buttocks were relieved by dusting with equal parts of Powder of Oxide of Zinc and lycopode and napkins were changed frequently and dry fresh ones applied.

Where the mouth was irritable e. g. in those cases which had a dirty tongue or symptoms of thrush, or even ulcerated papules a little mixture of

*R. Boraeys  
Pot. Chlor aa 3f  
Glycerini ad 3f*

was rubbed over the parts frequently with a clean finger after washing with clean water or rubbing out with a clean rag.

To assist the efforts of nature to free the stomach and intestines from the irritant

In six of my cases I washed out the stomach when I visited by passing a small No.7 soft rubber Catheter. This I attached firmly to a piece of glass tubing belonging to my ordinary syphon stomach tube with glass funnel. The child's arms were fastened by a bandage. The child was in a sitting position on the mother's knee with the head bent slightly forward. My left fore finger guided the Catheter over the base of the child's tongue into the stomach. Sterilized water cooled was used only. The funnel of the tube holding about 3 ounces was raised and depressed to cause a syphon action

and the process continued until the water returned clear. This method does not appeal to the people in a country practice; but in all the cases tried it proved very satisfactory.

In all the other cases, unless collapsed or weakened with much purging, I gave a preliminary powder or two, regulated according to age, and consisting of

*Rx Hydrag-e-culeo  
Sod Bicarb  
P. R. Kei*

In all the cases seen, I stopped the nourishment which at the time was given to the child. In the milder cases I found that an abstinence from nourishment for 8 hours - during which time the child had the preliminary stomach wash or purge, and had frequent drinks of fresh cool boiled water administered - sufficed.

If at the breast, the mother used in the interval, the breast pump and on resuming the nursing, the child did well.

The bottle-fed infants, in the milder cases, returned to barley water made so:

Two teaspoonfuls of good well washed pearl barley were put into one pint of cold water and boiled until reduced to  $\frac{2}{3}$  of a pint. This was strained and given in strength, or further diluted or skimmed milk, regulated



with water according to age each time was placed in a feeding bottle (plugged with cotton wool) which was placed in a pan of cold water, and this water was boiled for 15 minutes. This method practically sterilized the milk and is useful and easily prepared.

In my more severe cases, abstinence (from the general diet previously given) was carried out for a much longer period and according to the case. The nourishment given in these was either chicken or Hough tea or diluted Valentines Meat Juice, or white of egg diluted with water, or Whey with barley water.

Raw Meat Juice was of great service to me in the more tedious of my cases. This I prepared as follows:

Cut in small pieces a bit of rump steak. Pound this and reduce to a thick pulp. Place this pulp on a sieve with small holes. After being stirred and pressed till red and fleshy part can pass completely through the holes; then collect the red strained matter, strain it again.

I gave a drachm of this every 4 hours, sweetened with a little sugar.

The bottles and utensils used in conveying nourishment to the child were always well washed and kept scrupulously clean.

The drugs I used were of the Anteseptic order and given to render the influence of any Bacterial invasion less

hurtful, by improving the condition of the bowel and by diminishing the risk of a secondary fever from putrefaction and the development of ptomaines. The drugs I relied on were Salicylate of Soda in doses of 2 grains (for a child 1 year old) and given every 4 hours either alone or in combination with Bismuth Subnitrate in an equal dose in water often however I gave the subnitrate of Bismuth alone in powder and to a child 1 year old I gave half a drachm in the 24 hours.

Again I used Salol in powder and in one grain doses every 4 hours to a child 1 year old, or as follows

*By Saloli gr i  
Pulv. Ipecacanth Co. gr. 5  
Glycerini m vii  
Aq Menthe Piper ad Sp  
every 4 hours*

Where there was much pain I added  
Pulv. Ipecac. Co gr  $\frac{1}{2}$  every 4 hours (to a child one year old) to the above powder or combination in powder form and  
Tr Camphorae Co in 3 drop doses added to the mixture

In 25 of my cases I washed out the bowel high up by passing a soft rubber tube and attaching it to my fountain syringe. This was performed twice a day, and each time a half pint of (boiled water, which had been cooled) was allowed to run in and return. I found this method very soothing. In my worst cases, I replaced the fountain syringe with a large douche can and putting ice into this passed the water high up into the bowel in a very cold condition.

In every case, I administered freely doses of fresh boiled water cooled by placing the vessel in a large basin and surrounding it with ice.

I also administered in all my cases a warm bath to begin with, but when the cases were already depressed a warm and frequent sponging was substituted.

Brandy in regulated doses was the only stimulant used, and only when urgently needed.

For children from 12 - 24 mos., if required, I used this tonic to aid convalescence.

*Rx* *Pepp. Cori*  $\text{℥} \text{XV}$   
*Liq. Styrch.*  $\text{m} \text{ i}$   
*Quin. Sulph.*  $\text{℥} \text{ ii}$   
*Acid. Nit. Mur. dil.*  $\text{m} \text{ XV}$   
*Lith. Carini*  $\text{ad} \text{ ℥} \text{ i}$   
*Lf* *Teaspoonful in water every*  
*four hours before food*

## Examples of Cases

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Female child, 3 mos., fed on mother's milk, and living in a 3 roomed house, fairly comfortably furnished and clean. Father and mother and four other children are the other occupants of the house.

Father is of a strumous history.

Mother is fairly strong, eating and sleeping well.

For a week the child has been fretful and somewhat constipated, now the motions are loose.

The child looks distressed and its tongue has a whitish fur, but clean margin.

She cries a good deal, and moves the legs on the abdomen. The Temperature is normal.

And the pulse beats 132 in the minute.

Heart and lungs are normal.

The Abdomen is firm and painful on palpation.

There is no localised swelling or tenderness.

There is no vomiting.

The stools are 6 in the 12 hours and are green and ill smelling with particles of undigested milk scattered through the mass.

### Treatment

The suckling was stopped for 8 hours, and during this time the mother's breasts were relieved by the breast pump. The child had a powder of

*Pz Hydang ē culatē gp  
 Sod Biscuit pti  
 P. Rhei pti*

and a teaspoonful of cool boiled water given frequently  
 A specimen of the milk was examined analytically, and  
 found to be poor in fat and sugar and rich in Proteids.  
 I rectified the mother's diet, allowing her more butcher  
 meat and to take plenty of exercise, regulating the dis-  
 tance to be walked every day.

The child was put back to the breast.

Next day the child did not cry so much, and evidently  
 had not so much pain.

The bowels were still frequent, but not so smelling.

On the fourth day from first seeing the case the child  
 was better.

She now sleeps well and takes the breast regularly and  
 seems satisfied.

## Case II.

Male child, 4 months, fed on cow's milk in the propor-  
 tion of two tablespoonfuls of milk to one tablespoonful  
 of water and 1 teaspoonful of sugar. The feeding bottle  
 was clean. This child was living with Father and Mother,



one brother and one sister, in a one roomed house, which was clean and comfortable. There was nothing special to note in the family history.

The child had been "cross-grained" since birth, and had not "thriven".

He lay in bed with a normal temperature.

There were no evidences of teeth, but the tongue had a whitish fur.

All the organs were examined and found to be healthy, but the child looked "ill thriven".

He vomited after feeding and passed eight greenish yellow stools in the 24 hours. These stools were smelling. The pulse rate was 131 in the minute.

The abdomen was rather full, however, causing discomfort when palpated and when pressed the child vomited.

Treatment            The milk was stopped.

The child was arranged sitting on mother's knee with the head slightly forward, and the arms tied to the sides, and a small Catheter passed into the stomach and attached to a syphon stomach pump. The stomach was washed carefully out once.

After that the child had the tongue cleaned and was put comfortably to bed, and had little drinks of sterilized water administered frequently.



At the expiry of 8 hours I ordered him to have one table-spoonful of barley and three tablespoonfuls of sterilized water sweetened to be given every 3 hours.

I saw this child two days afterwards and found him better.

I now ordered one tablespoonful of new milk and 2 tablespoonfuls of sterilized water sweetened with sugar to be given every 3 hours from a feeding bottle. To this mixture was added one tablespoonful of lime water. I saw this child again four days afterwards and found him better. His muscles were firmer and he looked in every way thriving.

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### Case III.

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Female child, 5½ months, fed on cow's milk and "pickings" from table. Father and mother and two sisters lived in a two-roomed house, comfortably, but family inclined to be careless and dirty. Health of child good. Till the present time no difficulty in digesting milk. Child is fairly well nourished. Mother noticed, two days before, that the child vomited and was cross, and the motions became more frequent, and that the child was wakeful and restless and cried after getting food. The father and mother were healthy, but other members of

the family strumous looking.

Child lies in bed very fretful, and evidently in pain.

The temperature is  $101^{\circ}$ , and the pulse beats 145.

The face is anxious in expression and pale. The lips are well coloured, and the tongue has a dry, brownish fur upon the dorsum.

There are two lower mid incisor teeth, but the gums are not otherwise tender.

The Bones are well clothed, but the flesh is soft.

No abnormality in heart or lungs.

Abdomen can be palpated all over, and there is no resistance anywhere.

No vomiting.

Motions are 10 in 24 hours, and are greenish brown in colour, and of a semi-fluid consistence.

Treatment Present diet stopped.

Child ordered a warm bath and a change of clothing. She was taken to the "room" of the house, which had been meanwhile put in order.

A powder was given the child, consisting of

*Hyd Mag c culac -  $\frac{ss}{i}$   
Sod Bicarb  $\frac{ss}{i}$   
P. Rhei  $\frac{ss}{i}$*

Teaspoonfuls of cool (boiled water) were administered frequently.

At the expiry of 6 hours the child had some barley water given every 2 hours.

Next day child's temperature was  $99^{\circ}$ , and the pulse 135. The motions were eight in the 24 hours, were not smelling but still loose.

The Barley water was continued and 2 grains of Subnitrate of Bismuth, with  $\frac{1}{2}$  grain of Salicylate of Soda were given in powder every 4 hours.

Two days afterwards, child much better. The motions were four in the 24 hours.

On the 6th day, I ordered

	(	New milk	2	parts.
1 teaspoonful sugar	(	Sterilized water	3	-
	(	Lime water	1	-

and the powders were continued.

On the 8th day, the child was better, and the mixture prescribed agreeing with her was continued and

The powders were stopped

Next day, child well.

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#### Case IV.

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Male child, 8 months, fed on cow's milk 3 parts to one of water, from a dirty feeding bottle.

The child lives in a "kitchen" with father and mother, 4 brothers and one sister. The surroundings are dirty, and the case was seen in the month of August, a hot month.

The child had no previous history of illness.

#### Present state -

Temperature 102°.

Other organs healthy.

Abdomen not painful, and no evidence of localised swelling.

The child does not vomit, but the motions are passed every half hour, and are watery, but no trace of blood.

The child is ill looking and collapsed.

He has four teeth, upper and lower incisors.

Treatment - The milk is stopped, and the child sponged all over with tepid water by the nurse and placed in a clean cot, after having a clean night gown and napkin adjusted, and kept with warm extremities. The room is dusted over with a wet cloth, and the windows are opened, and the kitchen kept aired, but free from draught.

No purge is given to the child, but frequent drinks of

cool boiled water are ordered in which is a little stimulant, and a poultice is applied to the abdomen for two hours.

Six hours afterwards, the child is no better.

A long tube is passed far up into the bowel and adjusted to a douche can and half a pint of ice cold water is allowed to run into the bowel and out again.

Powders containing

Salol	gr. $\frac{1}{1}$	
Bismuth	gr. $\frac{111}{111}$	given every

4 hours, and a little weak barley water is ordered.

Next morning, Temperature  $101^{\circ}$ . Child has slept well during the night, and now appears not so collapsed. The motions are still frequent, but reduced to 8 in the day. The last one passed is tinged with blood.

The bowel is washed again with iced water (boiled and cooled) from a Fountain Syringe, and everything is continued as before.

Evening Temperature  $101^{\circ}$ . Motions the same, but during the day, the child drank the sterilized water greedily

Continue as before.

Next morning

Child has passed three motions during the night.

Intestinal douche continued, and a teaspoonful of raw.

meat juice given every 4 hours, alternating with the weak barley water.

The powders were also continued.

#### Evening

Temperature 99°.

3 motions during the day of semi-solid consistence of a deep blackish brown colour.

The bowel was washed out again and nourishment and medicine continued.

#### Morning

Temperature normal.

One motion during night.

Child slept well, and did not waken for much nourishment

I did not wash out the bowel.

Ordered a little weak chicken tea.

The barley water was stopped and the raw meat juice continued.

#### Next day

Temperature normal

Two motions since yesterday of a natural colour.

Child is better and bright and takes the nourishment greedily.

I stopped the powders.

By this time the child was almost well.



At the end of the 7th day, the child was digesting 2 parts milk, 3 parts water (sterilized) and sweetened and one tablespoonful lime water was added.

These illustrations are given to show that each case was carefully looked into, and in all, save two, the treatment adopted acted well, and in the large majority of cases recovery was rapid.

But the whole function of the medical man does not begin and end with the treatment, and, if possible, the cure of the sick. It is an accepted fact now, that medical science can possibly do a little more, and that in addition to the treatment of disease something may be done towards its prevention.

In every case, at my visit, I impressed upon the mother or nurse the probable capacity of the child's stomach and the quantity of food to be given at each meal, and the number of meals to be given in the 24 hours. I also impressed the facts, that the milk and water used should be pure and sterile, and properly prepared for each meal, and preserved cool and free from dust, &c., between the feedings. The milk to be received from the milkman and passed through a muslin sieve and afterwards preserved in a vessel and set in a basin with cold water (iced if required) and stored in a cool part of the house. I

also warned the parents that the children should never be exposed to draughts, or night air, or differences of temperature.

That the intestines should have a daily evacuation.

That comfortable clothing should be provided and adjusted to meet the variations in weather.

That the children should be protected from dampness, and should not sleep in draughts.

That in hot weather more liquid and less solid food should be given.

That Food of all sorts should be fresh and free from decomposition.

In my opinion, I believe that when there is impressed upon parents the desire to have a freer supply of fresh air (free from draughts) and pure water in their houses, and a like desire to abhor every variety of filth and dirt in house and person; a new energy may become inherent in their minds, and may be reflected in a little care for the welfare of the children.

I would also advocate

A proper supervision of all places in which people are congregated, whether for work, education or domestic life.

Let there be more compulsory improvements in cleanliness of houses and back courts and sinks, sewers and ashpits.

A proper inspection of food, dairies and shops, in which food is sold.

I would also advocate the establishment of one or two depots in the poorer districts of a town or "thriving" village from which could be cheaply sold bottles duly filled with filtered milk properly made up, - cleaned, well stoppered and accompanied by simple instructions. This might achieve great good and could, I believe, be quite well worked.

By a proper and more conscientious interest in the above details, and a restoration to people the birth right of our common humanity:

- pure air, pure water, and sunlight, free from smoke and noxious vapours, &c.-

When these are attainable, I believe there will soon be a considerable amelioration in the condition of infants, especially as regards diarrhoeal troubles.

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